

**NON-INVASIVE METHOD AND APPARATUS FOR CARDIAC
PACEMAKER PACING PARAMETER OPTIMIZATION AND
MONITORING OF CARDIAC DYSFUNCTION**

ABSTRACT

5 Non-invasive method and apparatus for monitoring the condition of a
heart failure patient and for optimizing the pacing parameters of a cardiac
device implanted in a patient. A plethysmogram signal, e.g., a finger
photoplethysmogram, is obtained from a patient and provided to a
programmer device. The plethysmogram signal is analyzed by the
10 programmer device to obtain a cardiac performance parameter, e.g., a
pulse amplitude response, a degree of pulsus alternans, or irregularity in
the pressure pulses detected in an atrial fibrillation patient. The effect on
the cardiac performance parameter derived from the plethysmogram is
determined for various pacing parameter values in a manner so as to
15 reject noncardiogenic effects and artifacts. Pacing parameters resulting in
the best cardiac performance parameter may be selected as the optimum
pacing parameters. The programmer device may monitor a Valsalva
maneuver performed by a patient. Optimum pacing parameters may be
derived by analysis of the plethysmogram signals obtained during
20 performance of the Valsalva maneuver using different pacing parameters.